SYNOPSIS

Title : "SOME CONTRIBUTIONS ON FUZZY SET AND ITS APPLICATION ON GROUP THEORY"

a) WORK PLAN

M. Daws established sufficient conditions for the uniqueness of the weak topology on group algebras, while N. J. Yong examined the properties of multiplication within group algebras. We propose to explore the comparative features of semigroup measure algebras, Fourier–Stieltjes algebras, and commutative algebras. We propose to establish fuzzy inner product induces a fuzzy norm, although every fuzzy normed space can be equipped with a fuzzy semi–inner product structure, including an associated notion of orthogonality. Furthermore, we discuss the properties of fuzzy conorm and fuzzy co-orthogonality arising from fuzzy co–inner product spaces in linear settings. Moreover, Fuzzy sets have been widely used to model uncertainty in observational data, employing either an ontic or epistemic interpretation. The ontic interpretation treats point-wise uncertainties as inherent properties of entities, while the epistemic interpretation views a fuzzy set as a representation of incomplete information about single-valued attributes.

We propose to develop the properties of interval-valued fuzzy soft sets, formed by combining interval-valued fuzzy sets with soft sets. We introduce the notion of the energy of an interval-valued fuzzy soft set, along with its pessimistic and optimistic energy measures, which together support the construction of an effective decision-making algorithm. Additionally, we discuss the role of Bayesian methods for fuzzy parameters, extending the concept of fuzzy random variables by incorporating fuzzy prior distributions. The Bayesian estimation approach will be used to obtain fuzzy Bayes point estimators for assessing the reliability of transportation systems, employing the "resolution identity" technique from fuzzy set theory. We propose to analyze the structural-reliability and connectivity-reliability properties, which are critical for designing and assessing transportation systems. We intend to generalize and distinguish the characteristic features in the frequency domain by employing complex-reliability functions that model the system's fuzzy behavior. Transportation networks - including road, aviation, and rail - are vital for societal functioning, and these systems are deeply interconnected. To capture this interconnection, we will extend cyber-physical system models using classical reliability techniques. In particular, we argue that network

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reliability is especially well-suited for modeling cyber-systems. We will also carry out a comparative analysis of renewal theory and queuing theory. Finally, we plan to address transportation modeling problems, queuing-system information theory, and OR methodologies - showing how these, alongside computational methods, are converging into a distinct, unified scientific discipline.

b) DETAILS OF PROJECT WITH CHAPTALISATION

Zadeh introduced the theory of fuzzy sets to address imprecision and uncertainty, leading to the development of several related approaches. Some of these extend the original fuzzy set framework, while others tackle uncertainty through alternative concepts. Notable among these are Atanassov's intuitionistic fuzzy sets, Gau and Buehrer's vague set theory, and Pawlak's rough set theory. Interval-valued fuzzy sets were independently introduced by Zadeh, Grattan-Guinness, Jahn, and Sambuc. Although each of these theories contributes valuable insights, they also face limitations when dealing with certain forms of imprecision and uncertainty. We propose to address difficulties arising from the lack of adequate tools for parameterizing these frameworks. Molodtsov's theory of soft sets provides a mathematical tool that overcomes many of these challenges, offering a more flexible approach to uncertainty and imprecision.

Chapter - 1 Comparative structure on Fuzzy interpretation of topological space and its applications

We extend fuzzy set method to continuity, compactness and separation axioms in bitopological space. We further propose to introduced the concept of pairwise to T1, T2 topological spaces to establish its unification.

Chapter - 2 Properties of Fuzzy technique and its advantages in programming

This approach is based on stochastic dynamic programming of fuzzy framework for optimization of fuzzy control systems in Queueing theory with its adequate reliability. we propose to discuss the problems on Queues, information theory and decision theory by suitable application of Markov analysis and Fuzzy-methods.

Chapter - 3 Completeness and convergence properties of Markov analysis and Fuzzy-methods

This approach is based on stochastic dynamic programming of fuzzy framework for optimization of fuzzy control systems in Queueing theory with its adequate reliability.

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we propose to discuss the problems on Queues, information theory and decision theory by suitable application of Markov analysis and Fuzzy-methods.

Chapter - 4 Fuzzy interpretation of fuzzy Hilbert space

We propose to discuss properties of fuzzy Hilbert space and its relation with fuzzy inner product space in the context of completeness and convergence properties. We propose to reformulate. Riesz. Representation theorem in fuzzy Hilbert space including its isomorphism. Fellin introduced the concept of fuzzy normed linear space.

c) HYPOTHESIS

We propose to develop the theory of quasi-continuous multi-functions, noting that as shown by Neubrunn certain results valid in ordinary topological spaces do not necessarily hold in bitopological spaces. We also aim to extend bitopological separation axioms to fuzzy topological spaces and establish the relationships among them. Zadeh introduced the concept of fuzzy sets, which has been widely applied across various areas of mathematics and the physical sciences. Chang subsequently introduced fuzzy topology, and Coker further investigated fuzzy topological spaces. We aim to further develop the structure of Arens regularity and local reflexivity in light of the results established by B. Lochum and G. Loupias.

d) METHODOLOGY

The research project is purely theoretic nature and its main thrust is on category theoretic as well as fuzzy structure and its application on group theory. The facilities available in the central library, B. N. Mandal University, Madhepura. If required, the facilities for consulting relevant references through Journals may be availed from National Library, (Science section) and I. S. I, Calcutta.

e) REFERENCES

1.	Hille, E and Phillips, R. S (1957)	Functional analysis and semigroups Amer. Math Soc. Prov. R. I.
2.	*Lee, A. M. (1966)*	Applied Queuing theory, Macmillan, London
3.	Bellman R.E., Zadeh L.A., (1970)	"Decision making in a fuzzy environment", Management Sci. 17, pp. 141-164.

Nutan kumari
28.11.25

4.	L.A. Zadeh. (1975)	The concept of a linguistic variable, and its application to approximate reasoning. Inform. Sci. 8:199-249 & 9:43-89,
5.	Ignizio, J. P., J. N. D. Gupta, and G. R. McNichols. 1975	Operations Research in Decision Making. New York: Crane, Russak & Company, Inc. 343 pp.
6.	Zadeh, L. A. (1978)	Fuzzy sets as a basis for a theory of possibility. Fuzzy Sets and Systems,1,3-28.
7.	Zimmermann, H (1978)	Fuzzy programming and linear programming with several objective Fuzzy sets & system V (45, -53)
8.	Dubois, D., & Prade, H. (1979)	Fuzzy real algebra: Some results. Fuzzy Sets and Systems, 2, 327–348.
9.	Gil, M. A., Corral, N., & Gil, P. (1985)	The fuzzy decision problem: An approach to the point estimation problem with fuzzy information. European Journal of Operational Research, 22, 26–34.
10.	Misra, K. B., & Weber, G. G. (1990)	Use of fuzzy set theory for level-I studies in probabilistic risk assessment. Fuzzy Sets and Systems, 37, 139–160.
11.	Cai, K. Y., Wen, C. Y., & Zhang, M. L. (1991)	Fuzzy variables as a basis for a theory of fuzzy reliability in the possibility context. Fuzzy Sets and Systems, 42, 145–172.
12.	Dubois, D. and H. Prade. (1991)	Random sets and fuzzy interval analysis. Fuzzy Sets & Syst., 42:87-101
13.	Chen, S.-M. (1994)	Fuzzy system reliability analysis using fuzzy number arithmetic operations. Fuzzy Sets and Systems, 64, 31–38.
14.	Chanas S., Kuchta D., (1998)	Fuzzy integer transporting problem", Fuzzy Sets and Systems 98 pp. 291- 298.
15.	F. Ghahrami and R. Stoke (2007)	Approximate Pseude-amenability of the Fourier algebra, Indiana university math 56 (909 -930)
16.	Cai, K. Y., Wen, C. Y., & Zhang, M. L. (1991).	Fuzzy variables as a basis for a theory of fuzzy reliability in the possibility context. Fuzzy Sets and Systems, 42, 145–172.
17.	X. Peng, H. Garg, (2018)	Algorithms for interval-valued fuzzy soft sets in emergency decision making based on WDBA and

Nutan kumari

28.11.25

		CODAS with new information measure, Computers & Industrial Engineering 119 439–452.
18.	X. Ma, Q. Fei, H. Qin, H. Li, W. Chen, (2021)	A new efficient decision making algorithm based on interval-valued fuzzy soft set, Applied Intelligence, Volume 51, Issue 6 3226–3240.
19.	Lj. Mudri´c Stani˘skovski, Lj. Djurovi´c, N. Stojanovi´c, (2024)	Energy of a fuzzy soft set and its application in decision-making, Iranian Journal of Fuzzy Systems, Volume 21, Number 2 35–49.

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